BIG DATA EVALUATION: PRELIMINARY RESULTS

Framework for Evaluating Big Data in Regional Travel and Mobility Analyses

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Framework for Evaluating Big Data in Regional Travel and Mobility Analyses

- Conduct an independent evaluation of Big Data and its use and limitations in regional travel and mobility analyses and modelling.

- With processing and analytics tools, **Big Data can illustrate patterns and trends in human behavior and activity.**

- Big Data sources with transportation planning applications include passively collected data from mobile applications, including GPS traces and location-based services, on-board vehicle sensors, traffic sensors and cameras, unmanned aircraft/space-based radar used to monitor traffic flow, and smart card data, among others.

Scope

1. Establish Study Work Group (membership, responsibilities, and meeting schedule) and study work plan

2. Develop understanding of TPB programmatic requirements and analytical/modelling processes

3. Review state of the practice of Big Data use and applications by other MPOs

4. Conduct an independent evaluation of Big Data sources for their potential in supporting TPB staff in meeting its programmatic requirements

5. Recommend options and considerations for acquiring Big Data ◄ We are here

6. Prepare a final report

Research Considerations

The research areas specifically considered as part of this evaluation consist of eight (8) general categories:

1. Travel Demand Forecasting (TDF)
2. Transit and Non-Motorized Travel
3. Transportation Network Companies (TNCs)
4. Travel Demand Management (TDM)
5. Connected Autonomous Vehicles (CAVs)
6. Traffic Counts
7. System Performance/Congestion Management
8. Other Research Areas

Research Methodology

- Survey to peer MPOs and DOTs

- Peer agency interviews

- Literature review (e.g. validation studies, case studies)

- Direct vendor outreach

- Internal consultant research team nationwide outreach

Peer MPOs and DOTs

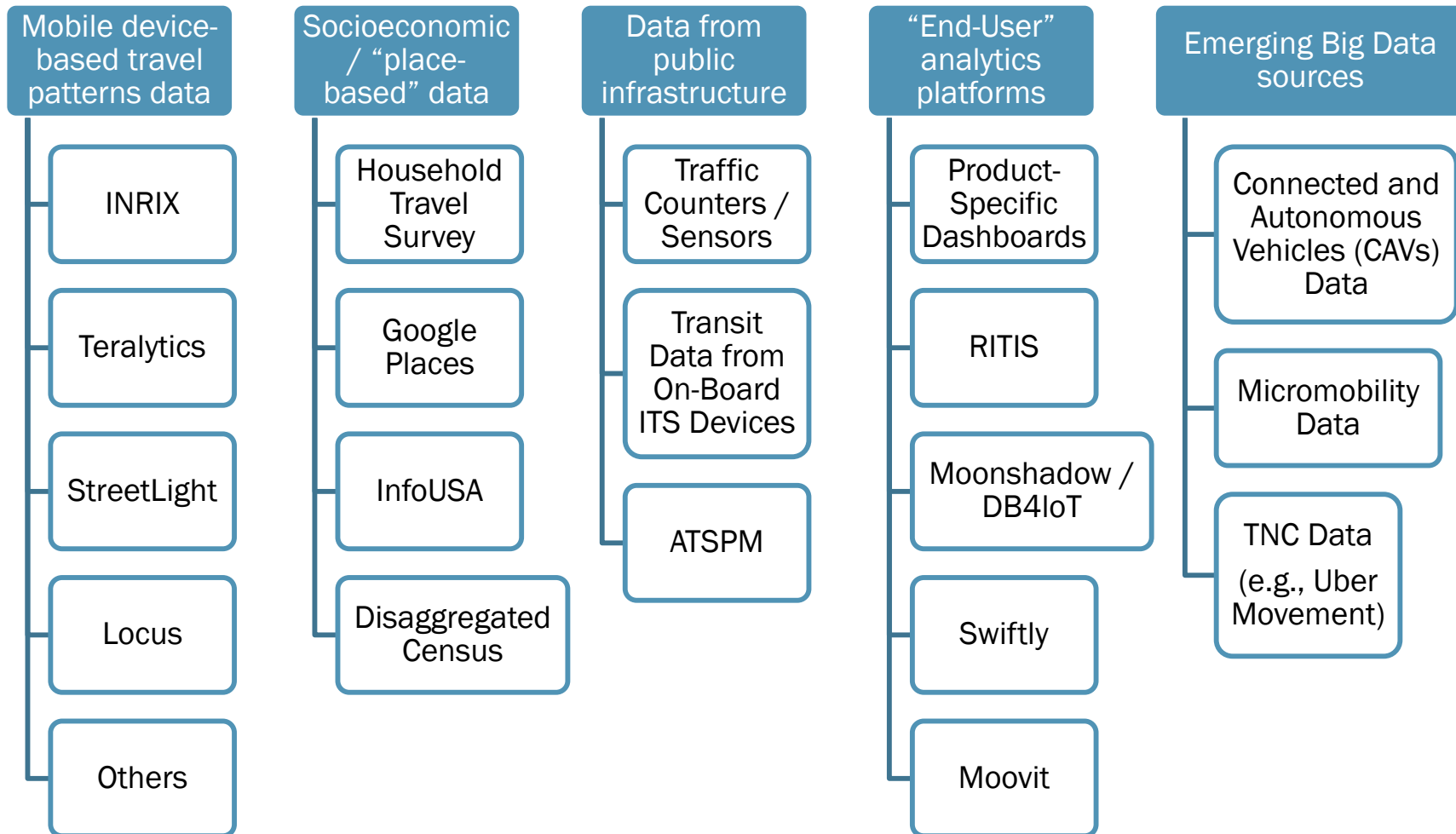|	
Atlanta Regional Commission	North Central Texas Council of Governments
Capital Region Planning Commission (Baton Rouge, LA)	North Jersey Transportation Planning Authority
Chicago Metropolitan Agency for Planning	Northeast Ohio Areawide Coordinating Agency
Delaware Valley Regional Planning Commission	Portland Metro (Oregon)
East-West Gateway Council of Governments (St. Louis, MO)	Pima Association of Governments (Arizona)
Florida Metropolitan Planning Organization Advisory Council	Regional Transportation Commission of Southern Nevada
Fredericksburg Area Metropolitan Planning Organization	Southeast Michigan Council of Governments
Houston-Galveston Area Council	Southern California Association of Governments
Maricopa Association of Government (Arizona)	Virginia Department of Transportation
Mid-Ohio Regional Planning Commission (Columbus, OH)	Wasatch Front Regional Council
New York Metropolitan Transportation Council	Anonymous
North Central Texas Council of Governments	

Phase 1: Survey and Interview Findings

- Big Data sources are still new to most MPOs and agencies

- High level of interest; healthy skepticism

- Notable areas in which Big Data is more widely used
  - External travel survey for travel demand model
  - Speed/travel time calibration/validation (aggregate/corridor-level)
  - System congestion monitoring/management

- Lessons learned / concerns
  - Technical processing challenges
  - Sample adequacy and validity
  - Aligning data with needs (e.g. trip purpose)
  - High costs or unclear pricing

Phase 2: Evaluation
Establish a List of Big Data Products for Evaluation

Mobile device-based travel patterns data	Socioeconomic / "place-based" data	Data from public infrastructure	"End-User" analytics platforms	Emerging Big Data sources
INRIX	Household Travel Survey	Traffic Counters / Sensors	Product-Specific Dashboards	Connected and Autonomous Vehicles (CAVs) Data
Teralytics	Google Places	Transit Data from On-Board ITS Devices	RITIS	Micromobility Data
StreetLight	InfoUSA	ATSPM	Moonshadow / DB4IoT	TNC Data (e.g., Uber Movement)
Locus	Disaggregated Census		Swiftly	
Others			Moovit	

Note: this is not a full list of data products evaluated in this study

Phase 2: Evaluation Methodology

Evaluate products for each research area

- Applicability
- Data validity and coverage
- Resource - technical staff
- Resource - IT/computing/data storage
- Data licensing/sharing restrictions
- Cost

Develop "menu" of options for investment and procurement

- Products meeting several research needs
- Partnerships with states/jurisdictions

Preliminary Findings

- No "one size fits all" solution to all of COG/TPB's research needs

- Some products offer more detailed metrics, but at what cost to validity?

- Products are constantly evolving; some are still emerging

- How to navigate the landscape of "Big Data for Agency X" vs. "Big Data for COG/TPB"?

No "One Size Fits All"

- Common challenges faced in multiple research areas:
  - Breakdown of travel pattern data by mode
  - Trip purpose
  - Sample size vs. spatial accuracy
  - Large scale implementation

Origin-Destination

Trip Mode

Trip Purpose

Data Coverage
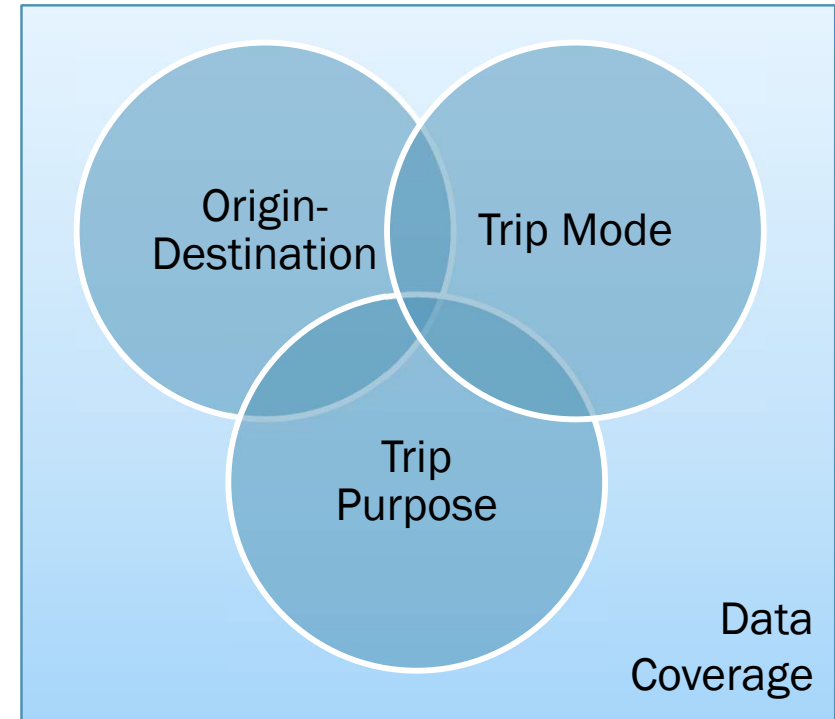
Approach to recommendations:
- *Is there a product that is applicable to multiple research areas?*
- *What are COG/TPB's most pressing needs and biggest concerns?*

Evolving Landscape of Big Data

- FHWA is developing **open source** big data algorithms that are available to all

- Innovative survey methods (integrating mobile devices and Big Data from providers)

- End-user analytics/platform offers computational capabilities

- Data from public infrastructure provides another dimension

- Emerging data sources (e.g., Connected Vehicles, TNCs, micromobility)

Opportunities for Collaboration and Data Sharing

- Opportunities for partnerships and collaborations at multiple levels
  - States/jurisdictions
  - Transit agencies
  - End-user analytics/platform providers
  - Mobility providers
  - Within COG/TPB

- Opportunities for data sharing
  - Expanding data spatial coverage from current state agency agreements with vendors
  - Developing new agreements that leverage regional collaboration
  - Central repository of planning data for the region

Known Challenges/Limitations

- Everyone claims to know something, but who is right and to what degree

- Difficulty in understanding/controlling the "black box"

- Extrapolating from "sampled trips" to "counts" and by mode

- Managed lanes (especially privately-owned)

- TNC data largely inaccessible; mobility analytics provided by TNC vendors have limited usage

Next Steps

- Review recommendations

- Consult with agency partners

- Develop implementation/procurement strategies

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